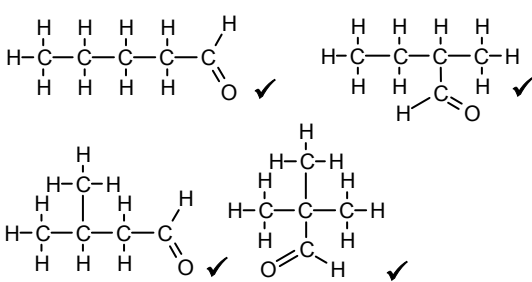


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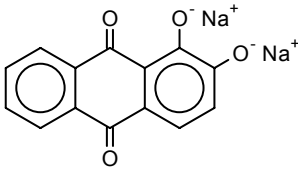
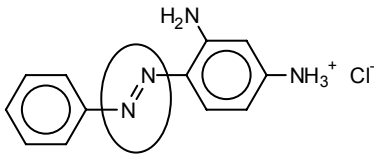
Qu.	Expected answers:	Marks:
1 (a) (i)	(relative) molecular mass / $M_r$ ✓	[1]
(ii)	right / highest $m/e$ / highest mass / second highest mass etc ✓ <b>AW</b>	[1]
(b)		[4]
(c)	Tollens' reagent / ammoniacal silver nitrate ✓ warm / heat ✓ aldehyde: silver mirror ✓ ketone: no reaction / change ✓	allow use of warm acidified $K_2Cr_2O_7$ to give green or Fehlings/ Benedicts to give red ppt [4]
(d) (i)	yellow / orange / red ✓ precipitate / solid / crystals ✓	[2]
(ii)	measure the melting point (of the solid / ppt) ✓  (re)crystallise / purify / compare result with known compounds / data book ✓	[2]
(e) (i)	no peak at 9.5 - 10.0 / peak with area 1 ✓	[1]

Qu 1 continued overleaf

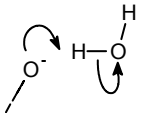
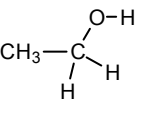
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Qu.	Expected answers:	Marks:
<b>Q 1 continued</b>		
<b>1 (e) (ii)</b>	$\text{CH}_3\text{-CH}_2\text{-}\overset{\text{O}}{\underset{\text{  }}{\text{C}}}\text{-CH}_2\text{-CH}_3$ / pentan-3-one ✓  1 mark for identifying the correct structure  <b>the peak at 1.1 ...</b> (is in the range 0.7-1.6 so) is due to CH <sub>3</sub> /R-CH <sub>3</sub> group(s) ✓ is a triplet / 1:2:1 as it is next to a CH <sub>2</sub> /two protons ✓  is due to six protons/two CH <sub>3</sub> (in the same environment) ✓  <b>the peak at 2.4 ...</b> (is in the range 2.0 – 2.9 so) is due to the CH <sub>2</sub> /-CO-CH <sub>2</sub> -R group(s) ✓ is a quartet / 1:3:3:1 as it is next to a CH <sub>3</sub> /three protons ✓  is due to four protons/two CH <sub>2</sub> (in the same environment) ✓  <b>the number of peaks ...</b> (two peaks, so only) two environments/ two types of proton / Ha and Hb on structure /each CH <sub>3</sub> CH <sub>2</sub> - is identical etc ✓  three environments for methylbutanone so would get 3 peaks/ Ha, Hb, Hc shown on a structure ✓  four environments for for pentan-2-one so would get 4 peaks / Ha, Hb, Hc, Hd shown on a structure ✓   <p style="text-align: right;"><b>ANY 5 reasoning marks out of 9</b></p>	<p style="text-align: right;"><b>max</b> <b>[6]</b></p> <p style="text-align: right;"><b>[Total: 21]</b></p>

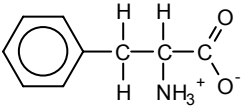
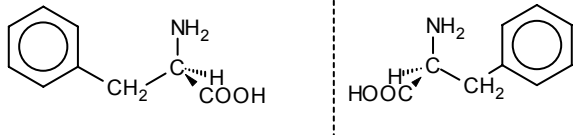
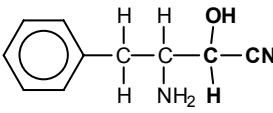
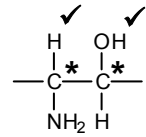
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Qu.	Expected answers:	Marks:
2 (a)	carbonyl / ketone ✓ phenol ✓	[2]
(b) (i)	C <sub>14</sub> H <sub>8</sub> O <sub>4</sub> 1 for C <sub>14</sub> ... ✓ 1 for ...H <sub>8</sub> O <sub>4</sub> ✓	[2]
(ii)	moles dissolved = 0.800 x 0.015 = <b>0.012</b> / conc in gdm <sup>-3</sup> = 0.015 x 240 = <b>3.6(g)</b> ✓  mass dissolved = 0.0120mol x 240 / 3.6gdm <sup>-3</sup> x 0.800 = <b>2.88/2.9(g)</b> ✓ (or ecf)	[2]
(c)	 H <sub>2</sub> O as product ✓ balanced equation ✓	[3]
(d)	C=O / carbonyl ✓ 1680 – 1750 ✓ O-H / hydroxy(l) ✓ 3230 – 3550 ✓	[4]
(e)		[1]
		[Total: 14]

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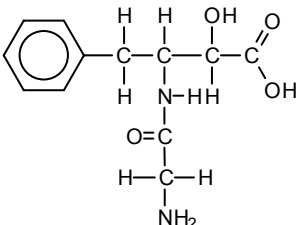
Qu.	Expected answers:	Marks:
3 (a)	$\text{CH}_3\text{CHO} + 2[\text{H}] \longrightarrow \text{C}_2\text{H}_5\text{OH}$ where $\text{CH}_3\text{CHO} \longrightarrow \text{C}_2\text{H}_5\text{OH}$ gets ✓ and also $2[\text{H}]$ to give a correct balanced equation ✓	[2]
(b) (i)	 ✓✓ one mark for each curly arrow	[2]
(ii)	 ✓	[1]
(iii)	electron/lone pair donor	[1]
(iv)	nucleophile/hydride is attracted to a positive (charge) centre / $\delta^+$ carbon /area of electron deficiency ✓  (its lone pair of electrons) forms a (covalent/dative) <u>bond</u> ✓  the double/ $\pi$ electron <u>pair</u> goes to the oxygen atom ... ✓  ... (causing )the carbonyl/double/ $\pi$ <u>bond</u> to break ✓  <p style="text-align: right;"><b>ANY 3 out of 4 marks</b></p>	[3]
(c)	hydrogen has no lone pair	[1]
		<b>[Total: 10]</b>

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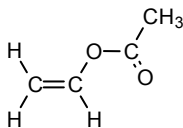
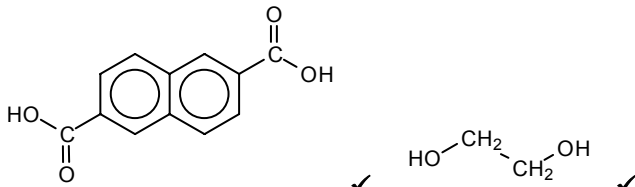
Qu.	Expected answers:	Marks:
4 (a)	$\text{RCH}(\text{NH}_2)\text{COOH}$ ✓	[1]
(b)	 (or shown with delocalised $\text{COO}^-$ ) either $-\text{NH}_3^+$ or $-\text{COO}^-$ shown in the right place ✓ rest of the structure correct ✓	[2]
(c) (i)	optical (isomerism)	[1]
(ii)	 (or shown as zwitterion, or with $\text{C}_7\text{H}_7$ ) at least one structure correctly drawn ✓ a correct mirror image ✓	[2]
(d)	difference in position of the $\text{NH}_2$ relative to the $\text{COOH}$ ✓ an OH group (in <b>G</b> ) ✓ extra carbon /longer chain (in <b>G</b> ) ✓ extra chiral centre (in <b>G</b> ) ✓ <div style="text-align: right;"><b>ANY 3 out of 4</b></div>	[3]
(e) (i)	 ✓	[1]
(ii)	for lengthening the carbon chain / increasing the number of carbon atoms ✓	[1]
(f) (i)		[2]
(ii)	a mixture of stereoisomers ... because <b>G</b> is made synthetically / not naturally /in the laboratory /the HCN can add above or below etc ✓	[1]

Qu 4 continued overleaf

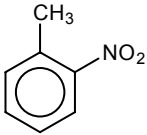
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Qu.	Expected answers:	Marks:
<b>Q 4 continued</b>		
<b>4 (g)</b>	 <p>NH and CO ✓ all bonds displayed correctly ✓</p>	<b>[2]</b>
<b>(h)</b>	<p>(only) one stereoisomer has the right shape / fits the active site etc / is pharmacologically active ✓</p> <p>the other stereoisomer may have (harmful) side-effects ✓</p> <p>increased dose is needed ✓</p> <p>valid reason for increased costs - eg testing of both isomers (<b>NOT</b> just related to increased dosage) ✓</p> <p><b>ANY 3 out of 4 marks</b></p>	<b>[3]</b>
		<b>[Total 19 Marks]</b>

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Qu.	Expected answers:	Marks:
5 (a)	<p>addition involves breaking a double bond ✓</p> <p>condensation involves loss of water / small molecule ✓</p> <p>correct PE repeat unit (either: <math>-\text{CH}_2-\text{CH}_2-</math> or <math>-\text{CH}_2-</math>) ✓</p> <p>equation to form PE from ethene showing 'n' monomers to give a polymer using 'n' / with at least 4 carbons extending on ✓</p> <p>correct ester link displayed in PET ✓</p> <p>correct PET repeat unit indicated ✓</p> <p>equation to form a correct repeat of PET and <math>\text{H}_2\text{O}</math>, showing at least one of each monomer ✓</p> <p><b>Quality of written communication</b></p> <p>mark for good organisation and a logical response ... examples are linked to the relevant definitions / the response attempts or implies a comparison</p>	<p>[7]</p> <p>[1]</p>
(b) (i)	 <p>✓</p>	[1]
(ii)	<p>dilute / aq / named concentration ✓</p> <p>acid / <math>\text{H}^+</math> / alkali / <math>\text{OH}^-</math> / suitable named acid or alkali ✓</p> <p>heat / reflux ✓</p>	[3]
(iii)	<p><math>\text{CH}_3\text{COOH}</math> (if acid hydrolysis in (ii)) / <math>\text{CH}_3\text{COO}^-</math> (from alkaline hydrolysis in (ii))</p>	[1]
(c)	 <p>✓</p>	[2]
<b>[Total: 15]</b>		

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Qu.	Expected answers:	Marks:
6 (a) (i)	CH <sub>3</sub> Cl / CH <sub>3</sub> Br ✓	[1]
(ii)	AlCl <sub>3</sub> / FeBr <sub>3</sub> etc ✓	[1]
(b)	 ✓	[1]
(c)	<p><b>stage 2</b>  H<sub>2</sub>SO<sub>4</sub> ✓  HNO<sub>3</sub> ✓  60°C ✓</p> <p>C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub> + HNO<sub>3</sub> → C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)NO<sub>2</sub> + H<sub>2</sub>O ✓</p> <p><b>stage 3</b>  tin ✓  HCl ✓  heat / reflux ✓</p> <p>C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)NO<sub>2</sub> + 6[H] → C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)NH<sub>2</sub> + 2H<sub>2</sub>O  (or with H<sup>+</sup> as well to give the salt C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)NH<sub>3</sub><sup>+</sup>) ✓</p> <p style="text-align: right;"><b>ANY 7 out of 8</b></p>	max [7]
	<p><b>Quality of Written Communication</b>  mark for technical terms ... answer contains at least two of the following terms:</p> <p>concentrated/conc (for any acid), nitration, nitrating mixture, electrophilic, substitution, reduction, catalyst (for H<sub>2</sub>SO<sub>4</sub> or tin), 2-methylnitrobenzene ✓</p>	[1]
<b>[Total 11 Marks]</b>		